

## **CHAPTER 1. INTRODUCTION**

### **TABLE OF CONTENTS**

1.1	DOCUMENT PURPOSE .....	1-1
1.2	HISTORY OF ELECTRIC MOTOR RULEMAKINGS .....	1-1
1.3	PROCESS FOR SETTING ENERGY CONSERVATION STANDARDS .....	1-2
1.3.1	Manufacturer Interviews .....	1-3
1.4	STRUCTURE OF THE DOCUMENT.....	1-4

### **LIST OF TABLES**

Table 1.3.1	Analyses by Rulemaking Stage .....	1-3
-------------	------------------------------------	-----

## **CHAPTER 1. INTRODUCTION**

### **1.1 DOCUMENT PURPOSE**

This preliminary technical support document (TSD) is a stand-alone report that presents the technical analyses that the U.S. Department of Energy (DOE or Department) has conducted in preparation for amending energy conservation standards for electric motors. The public is invited to comment on these analyses, either in writing or orally at a public meeting on August 21<sup>st</sup>, 2012. Details about the public meeting and instructions for submitting written comments are contained in the notice of public meeting (NOPM) published in the *Federal Register* before the date of the public meeting. DOE will review the comments it receives and revise and update these analyses prior to publishing a notice of proposed rulemaking (NOPR) in the *Federal Register*.

### **1.2 HISTORY OF ELECTRIC MOTOR RULEMAKINGS**

The Energy Policy and Conservation Act (EPCA), 42 U.S.C. § 6311, *et seq.*, as amended by the Energy Policy Act of 1992 (EPACT) established energy conservation standards and test procedures for certain commercial and industrial electric motors manufactured (alone or as a component of another piece of equipment) after October 24, 1997. Then, in December 2007, Congress passed into law the Energy Independence and Security Act of 2007 (EISA 2007) (Pub. L. No. 110–140). Section 313(b)(1) of EISA 2007 updated the energy conservation standards for those electric motors already covered by EPCA and established energy conservation standards for a larger scope of motors not previously covered. (42 U.S.C. 6313(b)(2))

EPCA also directs that the Secretary of Energy shall publish a final rule no later than 24 months after the effective date of the previous final rule to determine whether to amend the standards in effect for such product. Any such amendment shall apply to electric motors manufactured after a date which is five years after –

- (i) the effective date of the previous amendment; or
- (ii) if the previous final rule did not amend the standards, the earliest date by which a previous amendment could have been effective. (42 U.S.C. 6313(b)(4))

As described previously, EISA 2007 constitutes the most recent amendment to EPCA and energy conservation standards for electric motors. Because these amendments went into effect December 19, 2010, DOE is required by statute to publish a final rule determining whether to amend the EISA 2007 energy conservation standards for electric motors by December 19, 2012. DOE will determine whether to promulgate amended energy conservation standards for electric motors and, if so, what level the new standards should be set at based on an in-depth consideration of the technological feasibility, economic justification, and energy savings of candidate standards levels, as required by section 325 of EPCA. (42 U.S.C. 6295(o)-(p), 6316(a)) Any such amended standards that DOE establishes would require compliance as of December 19, 2015.

### 1.3 PROCESS FOR SETTING ENERGY CONSERVATION STANDARDS

Under EPCA, when DOE studies new or amended standards, it must consider, to the greatest extent practicable, the following seven factors:

- (1) the economic impact of the standard on the manufacturers and consumers of the products subject to the standard;
- (2) the savings in operating costs throughout the estimated average life of the products compared to any increase in the prices, initial costs, or maintenance expenses for the products that are likely to result from the imposition of the standard;
- (3) the total projected amount of energy savings likely to result directly from the imposition of the standard;
- (4) any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;
- (5) the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the imposition of the standard;
- (6) the need for national energy conservation; and
- (7) other factors the Secretary considers relevant. (42 U.S.C. 6295(o)(2)(B)(i))

Other statutory requirements are set forth in 42 U.S.C. 6295(o)(1)–(2)(A), (2)(B)(ii)–(iii), and (3)–(4).

DOE considers the participation of interested parties a very important part of the process for setting energy conservation standards. Through formal public notifications (*i.e.*, *Federal Register* notices), DOE encourages the participation of all interested parties during the comment period in each stage of the rulemaking. Beginning with the preliminary analysis for this rulemaking and during subsequent comment periods, interactions among interested parties provide a balanced discussion of the information that is required for the standards rulemaking.

Before DOE determines whether to adopt an amended energy conservation standard, it must first solicit comments on the proposed standard. (42 U.S.C. 6313(a)(6)(B)(i)) Any new or amended standard must be designed to achieve significant additional conservation of energy and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)) To determine whether economic justification exists, DOE must review comments on the proposal and determine that the benefits of the proposed standard exceed its burdens to the greatest extent practicable, weighing the seven factors listed above. (42 U.S.C. 6295 (o)(2)(B)(i))

After the publication of the preliminary analysis and a NOPM, the energy conservation standards rulemaking process involves two additional public notices that DOE publishes in the *Federal Register*. This first step of the rulemaking notices is a NOPM, which is designed to publicly vet the models and tools used in the preliminary rulemaking and to facilitate public

participation before the NOPR stage. The next notice is the NOPR, which presents a discussion of comments received in response to the NOPM and the preliminary analyses and analytical tools; analyses of the impacts of potential new or amended energy conservation standards on consumers, manufacturers, and the Nation; DOE's weighting of these impacts; and the proposed energy conservation standards for each product. The last notice is the final rule, which presents a discussion of the comments received in response to the NOPR, the revised analyses, DOE's weighting of these impacts, the amended energy conservation standards DOE is adopting for each product, and the effective dates of the amended energy conservation standards.

The analytical framework presented in this NOPM presents the different analyses, such as the engineering analysis and the consumer economic analyses (*e.g.*, the life-cycle cost (LCC) and payback period (PBP) analyses), the methods used for conducting them, and the relationships among the various analyses. Table 1.3.1 outlines the analyses DOE conducts for each stage of the rulemaking.

**Table 1.3.1 Analyses by Rulemaking Stage**

	<b>Preliminary</b>	<b>NOPR</b>	<b>Final Rule</b>
Market and technology assessment	✓	✓	✓
Screening analysis	✓	✓	✓
Engineering analysis	✓	✓	✓
Energy use characterization	✓	✓	✓
Product price determination	✓	✓	✓
Life-cycle cost and payback period analyses	✓	✓	✓
Life-cycle cost subgroup analysis		✓	✓
Shipments analysis	✓	✓	✓
National impact analysis	✓	✓	✓
Preliminary manufacturer impact analysis	✓		
Manufacturer impact analysis		✓	✓
Utility impact analysis		✓	✓
Employment impact analysis		✓	✓
Emissions Analysis		✓	✓
Regulatory impact analysis		✓	✓

DOE developed spreadsheets for the engineering, LCC, PBP, and national impact analyses (NIA) for each equipment class. The LCC workbook calculates the LCC and PBP at various energy efficiency levels. The NIA workbook does the same for national energy savings (NES) and national net present values (NPVs). All of these spreadsheets are available on the DOE website for electric motors:

[http://www1.eere.energy.gov/buildings/appliance\\_standards/commercial/electric\\_motors.html](http://www1.eere.energy.gov/buildings/appliance_standards/commercial/electric_motors.html)

### **1.3.1 Manufacturer Interviews**

As part of the information gathering and sharing process, DOE interviewed electric motor manufacturers. DOE selected companies that represented production of all types of equipment,

ranging from small to large manufacturers. DOE had four objectives for these interviews: (1) solicit manufacturer feedback on the draft inputs to the engineering analysis; (2) solicit feedback on topics related to the preliminary manufacturer impact analysis; (3) provide an opportunity, early in the rulemaking process, for manufacturers to express their concerns to DOE; and (4) foster cooperation between manufacturers and DOE.

DOE incorporated the information gathered during these interviews into its engineering analysis (chapter 5) and its preliminary manufacturer impact analysis (chapter 12). Following the publication of the preliminary analyses and the associated public meeting, DOE intends to hold additional meetings with manufacturers as part of the consultative process for the manufacturer impact analysis conducted during the NOPR phase of the rulemaking.

## **1.4 STRUCTURE OF THE DOCUMENT**

The preliminary TSD describes the analytical approaches used in the preliminary analysis and presents preliminary results. The TSD consists of 17 chapters, an executive summary, and several appendices.

Executive Summary	Describes the rulemaking process, identifies the key results of the preliminary analyses, and identifies the key issues for which DOE seeks public comment that resulted from the preliminary analyses.
Chapter 1	Introduction: provides an overview of the appliance standards program and how it applies to the electric motor rulemaking, and outlines the structure of the document.
Chapter 2	Analytical Framework: describes the methodology, the analytical tools, and relationships among the various analyses, summarizes issues and comments DOE received from its preliminary interviews with manufacturers, and explains DOE's responses to those comments.
Chapter 3	Market and Technology Assessment: provides DOE's definition of an electric motor, lists the proposed equipment classes, and names the major industry players. This chapter also provides an overview of electric motor technology, including techniques employed to improve motor efficiency.
Chapter 4	Screening Analysis: identifies all the design options that improve electric motor efficiency, and determines which of these DOE evaluated and which DOE screened out of its analysis.
Chapter 5	Engineering Analysis: discusses the methods used for developing the relationship between increased manufacturer price and increased efficiency. Presents detailed cost and efficiency information for the units of analysis.

Chapter 6	Markups for Equipment Price Determination: discusses the methods used for establishing markups for converting manufacturer prices to customer equipment prices.
Chapter 7	Energy Use Analysis: discusses the process used for generating energy-use estimates for the considered products as a function of standard levels.
Chapter 8	Life-Cycle Cost and Payback Period Analysis: discusses the effects of standards on individual customers and users of the products and compares the LCC and PBP of equipment with and without higher energy conservation standards.
Chapter 9	Shipments Analysis: discusses the methods used for forecasting the total number of electric motors that would be affected by standards.
Chapter 10	National Impact Analysis: discusses the methods used for forecasting national energy consumption and national consumer economic impacts in the absence and presence of standards.
Chapter 11	Life-Cycle Cost Subgroup Analysis: discusses the effects of standards on any identifiable subgroups of consumers who may be disproportionately affected by any proposed standard level. This chapter compares the LCC and PBP of products with and without higher energy conservation standards for these consumers.
Chapter 12	Manufacturer Impact Analysis: discusses the effects of standards on the finances and profitability of electric motor manufacturers.
Chapter 13	Employment Impact Analysis: discusses the effects of standards on national employment.
Chapter 14	Utility Impact Analysis: discusses the effects of standards on the electric utility industry.
Chapter 15	Emissions Analysis: discusses the effects of standards on three pollutants – sulfur dioxide (SO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), and mercury – as well as carbon emissions.
Chapter 16	Monetization of Emission Reductions Benefits: discusses the effects of standards on the monetary benefits likely to result from the reduced emissions of carbon dioxide (CO <sub>2</sub> ) and nitrogen oxides (NO <sub>x</sub> ).
Chapter 17	Regulatory Impact Analysis for Electric Motors: discusses the impact of non-regulatory alternatives to efficiency standards.
Appendices:	

App.5-A	Engineering Data
App.5-B	Sample Teardown Bill of Materials
App.7-A	Energy Use Scenario for Electric Motors with Higher Operating Speeds
App.8-A	User Instructions for Life-Cycle Cost and Payback Period Spreadsheets
App.8-B	Life-Cycle Cost and Payback Period Results
App.8-C	Life-Cycle Cost Sensitivity Analysis
App.10-A	User Instructions for Shipments and National Impact Analysis Spreadsheet Models
App.10-B	National Impact Analysis Sensitivity Analysis for Alternative Product Price Trend Scenarios
App.10-C	Full Fuel Cycle Multipliers
App.16-A	Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866: Estimates the social benefits of reducing carbon dioxide (CO <sub>2</sub> ) emissions into cost-benefit analyses.